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# Learning from Learning Groups

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## INTRODUCTION

Collaborative learning is a key, and complementary, component of student-centred enquiry-based pedagogy. Today, many educators understand that students learn effectively when working together with their peers to construct new knowledge. Many teachers are working to help their students develop such ability. Teachers do this to help students better understand the relevance of new content, connect new ideas into existing frameworks of understanding, and construct new neurological pathways and connect synapses in their brains. In addition, group learning has been shown to increase students' critical thinking skills, creativity, collaborative behaviours, understanding of ethics, and the like.

In the literature, attention has been paid to how groups of students can most effectively work together. Even greater attention has been paid to how teams work in business and industry. On the other hand, relatively little research has been reported about how groups of faculty can enhance their own knowledge and performance by embracing the concept of group learning—by learning in groups themselves.

At Dublin Institute of Technology (DIT) group learning is becoming the norm among teachers as well as students. As a result, DIT provides an ideal place to study the dynamics of group learning among teachers as well as among students. Moreover, in this particular institution, it is also possible to assess learning that occurs across groups—learning that filters its way up from the classroom into programmes, colleges, and administrative decision-making.

This paper summarizes formal research into three aspects of the group-learning movement that has emerged at DIT. The overall project involves data collection and analysis of: (1) a faculty peer-learning group that facilitated (2) student peer-learning groups in classes across the electrical engineering curriculum as part of (3) a broad institutional program designed to support professional development and enhance learning and teaching. The project summarized here uses interpretive, qualitative methods to investigate the dynamics of group learning.

## 1 FACULTY LEARNING

The first aspect of our study explores experiences of the members of a group of teachers who sought to facilitate collaborative problem-based learning (PBL) among their students. This component of the project used phenomenological methods. We conducted in-depth, semi-structured interviews with seven of the nine faculty members who had been involved in the peer-learning group. We sought to understand experiences participants had in the formal learning group. We analysed interview data and developed a model that describes how change occurred—change that resulted from this particular faculty-learning group's work. Detailed results of that study are being reported in the *Journal of Engineering Education* and will be described in the SEFI presentation [1].

To summarize: in DIT's electrical engineering systems programme one faculty member received a Teaching Fellowship in 2009. This small grant allowed the Teaching Fellow to (1) work together with his college's Head of Learning Development to (2) conduct research on student development, (3) develop a framework for implementing group PBL in his programme, (4) organize/conduct a formal peer-learning group comprised of nine of his fellow teachers that prompted them to learn about, refine, and implement new pedagogical approaches, and (5) share what he was doing with the larger institution through exhibitions and symposia. In collaboration with an advisor, he also presented and published two conference papers that envisioned ways to implement PBL and set out the steps needed to achieve change in programs like his [2].

Teachers in the learning group met monthly throughout the 2008-9 school year. They focused much of their conversation on how to deliver appropriate levels of engineering content, how to facilitate group learning, how to provide effective feedback, and how to foster self-directed learning among students. In working to master such topics, this faculty peer-learning group functioned in much the same way as its participants hoped the students groups would function.

Indeed, the faculty peer-learning group was able to direct its own learning [3]. It identified topics that needed attention, located relevant sources, researched critical issues, worked together to develop solutions, implemented and tested a range of

ideas in the classroom, discussed and evaluated various results, and refined and polished the techniques. Members of the group reached a point where they were able to successfully sustain the implementation of successful techniques. In other words, they moved from innovation into maintenance with regard to many of the techniques they found to be most effective [4].

The group directed its own learning—effectively enough that even today, two years after the formal learning group commenced, various members of the group still meet to discuss learning and teaching issues associated with this group's formal efforts. Informal discussions happen nearly every day in the faculty canteen. One faculty participant explained:

*Anyone who's interested in improving their teaching would generally [be involved in these] chats… that always goes on…. And it's partly the reason why I think group-based learning techniques work. Because what we're doing when we're having these chats, that's group based learning. …for us it's trying to develop …an understanding of how to teach better. But for our students it's about how to learn some difficult concepts.*

In analysing data from interviews with members of the faculty learning group, we discovered a number of structural / organizational components that contributed to the success of the group. In this case, the presence of certain key people / components was critical to fostering change and achieving success. The four key components we identified were the presence of: (1) a *group of individuals* eager and willing to engage in group learning and in fostering change, (2) a *champion* who helped focus their efforts around specific topics relevant to everyone in the group, (3) a wise and experienced *sage* or advisor who was able to provide targeted insight, cite pertinent literature, and share relevant stories, and (4) *institutional policies and programmes* designed to build capacity, foster collective learning, and spur pedagogical innovation.

Example statements from the faculty participants shed light on what they learned and why they participated:

*You definitely get a better understanding by talking [teaching issues] through with somebody else. … It kind of, clarifies your own position, that's what I find is one of the key things. You're getting other people's opinions as well—it's also influencing you.*

*I think having the conversations, both with [the advisor], but just amongst ourselves, kind of—what would you say—justified or validated by this kind of notion that it was something worth having a formal meeting about. That nearly adds value to every informal conversation that we have about it—you know what I mean?*

*[Group meetings are] a good time to kind of just formally pull those things out and say 'Have you got any advice on what we should be doing here?' And, I mean, I don't think [the advisor] would ever set himself up as a 'guru' you know, to us, or anything like that. But he was certainly able to give answers—both from his own experience and from the literature about the sort of things we were asking him—so that was good.*

It is clear that this group saw multiple benefits. They cited professional, intellectual, and social reasons to participate in the group and its activities:

*Our discussions are always interesting. They're enjoyable …that's sometimes why they go on so long. That's the over riding feeling: 'This is enjoyable. This is nice, to sort of flesh things out a little bit, to explore different avenues.' I think our job would become very stale very quickly if we didn't do that. And …one of the more enjoyable parts of the job is thinking about new ideas, seeing what works, trying things out. If we weren't doing that I think it would be quite a boring job.*

Participants note that they continue to change and develop even today—largely due

to their work with peers and their participation in this group. The group dynamic has been successful at drawing in converts and helping equip them to initiate change.

*I'm not on any modules this year with [the champion] who has been a main driver [of change]. But in a way I suppose [he] has spread the word around the Department so Problem-Based Learning does tend to happen… in most labs one way or another. And so, but I don't feel deliberately disconnected from it, I just, you know, I'm there, I'm going with the flow along that, with the Department. …I think everybody is interested in it. It's generally seen as a good thing. …I suppose it's coming into the things I do by osmosis more than anything else (it's not something that I'm sort of thinking long and hard about, you know). Like, I mean [it seeps into you by] working with others, and so on, who are doing it.*

## 2 STUDENT LEARNING

The second part of our study, the part that is currently underway, seeks to understand the lived experience of final-year engineering students who have been heavily involved in group-based enquiry-driven learning. As this portion of the study is just starting, we have conducted interviews with five students to date—all of whom were mature students who entered college after working in industry. Themes have yet to emerge, but we can learn from what the students have said, nonetheless. In this study, the interviewer is using semi-structured, open-ended questions in a dialogical fashion—to help draw ideas out of students. The questions probe how students feel when they are working in groups, how they establish roles within their teams, and how they understanding knowledge.

All students interviewed to date describe benefits of working in groups. Most of them express the belief that they learn more working together than individually. They have embraced the intent of group learning and have developed specific abilities as a result.

One student described group learning as more beneficial to him in that he retained more of what he learned this way. Student discussion of projects extends into the canteen in ways that other modules don't, he said, and they include a sense of excitement. This student described a situation where his lecturer had intentionally mixed the groups so students would bring diverse abilities to the table. In this case, he said, "I learned from [a teammate], and he learned from me." He also emphasized that:

*From talking with other students, as well, they probably learn best from problems they found quite difficult. I think it's information that, if someone asked you about what was the hardest part of what you'd done, on your project, you'd definitely be able to explain it to them. …I think that's the difference—the learning outcomes you get in [the PBL module called] RoboSumo or any sort of Self-Directed Learning probably retain better than what you get from the actual lecture.*

This student described RoboSumo as a turning point for him:

*Up through first year and right up to RoboSumo, I'd have been the type of person who was always trying to get the information from the lecturer. I wouldn't try to go and get the information myself—which was something I learned in RoboSumo. That it is possible to just go and get the information and if you have problems, the lecturer is there to sort of consult you, generally, and point you in the right direction. But you should be able to glean a lot of the information yourself.*

In doing so he identified his own epistemological development:

*You're taking what you learn from different sources and putting it into a form that's*

*more concise, more easier, for someone else to use. So, yes, you are creating knowledge.*

He described people who upload blog entries and YouTube videos on engineering-related topics as adding building blocks of knowledge for others to grow upon. Another student did not see himself as making new knowledge, and expected he never would be creating something entirely new. He did, however, reflect "integration of knowledge" [5] in that he recognized that he drew from past modules when addressing new problems. Nevertheless, he recognized that context matters, which reflects sophisticated thinking [6, 7, 8]:

*Engineering is not about one fix. It's about getting a whole array of things to work together to get an outcome. The solution to one situation isn't necessarily going to be the solution to a similar situation.*

Overall, he says, group-based learning:

*makes the module harder, because you have to put the extra work in. That's the downside. But it does give you a better understanding of it—if you do put the work in.*

A third student described leadership abilities that he had discovered and developed as a direct result of his work in group-based modules and projects. He noted that about half of all his classes had involved some form of group-based project work.

*Because the stuff is so hard, you need to have a sense of humour, so I suppose working in a team helps as well, with that.*

This student hadn't seen himself as a leader, but took a cue from a lecturer who asserted the students weren't getting the most they could out of college. The student took the initiative to start an Energy Society that organized monthly events and tours of industry. He did this to give other students a sense of the opportunities and sorts of jobs available. He says being involved in project-based teams had multiple benefits:

*An obvious [benefit] is I've learned to deal with slackers [by structuring and communicating consequences earlier in the process]. I've learned how to be more organized. I've learned how to be a leader and how to manage groups—manage our time together—the best scenarios to work in.*

He has learned this through a process of trial-and-error, he says:

*I see what failures we had in the past. I know much more now.*

All students described group-based courses as beneficial, but not all had the striking learning outcomes described by the three students above. One student who saw group PBL as beneficial, overall, had set clear limits on his own investment in learning and expressed grave dissatisfaction with a lecturer who failed to advise students well.

He noted that working in groups was more fun than working individually and that working in teams had allowed him to build strong friendships. On the other hand, he says he learned early on not to invest too much time in group-based projects:

*In RoboSumo, I'd have learned a very valuable lesson because there was too much time allocated for that. I'd say there was a lot of time wasted on it for what was got out of it, and other subjects did suffer as a result. I know that from personal experience. So you know* that*—going forward—did sort of open my eyes to other lab groups. Not to be sinking a lot of time into them, you know. Because there is other stuff running in the background. …that was probably the main lesson to be learned—not the robot at all.*

In future years, when the group ran into what multiple students identified as a lecturer

who failed to organize and facilitate PBL modules well, this student felt particularly disgruntled. His comments indicate the extreme importance of providing students with accurate feedback—not simply scores—when assessing homework completed by students who receive little content from the teacher. In this case, the student felt the teacher used the Socratic method and/or Self-Directed Learning as an excuse for leaving the entire burden (of finding and making sense of new content, and learning to communicate it effectively) on the student. The lecturer, however, seemed to make no attempt to provide feedback that would help students understand their errors.

*The perception about what "Self-Directed Learning" is should be addressed. You know, when you say "Self-Directed Learning" to someone, it immediately suggests you should go off and do everything yourself. That's not necessarily what it is about. A lecturer is still required to give out the material. He's required to teach, you know? …he has to be given the definition of Self-Directed Learning and of carrying it out.*

In light of all the benefits of group-based learning, this student's statements remind us of potential pitfalls in the system. Educators can't assume that all students are buying into the pedagogy and administrators need to assess the readiness of lecturers to apply innovative pedagogies before allowing them to teach modules where group project-based learning is key. This research can ultimately help the institution address shortfalls such as this.

## 3 ORGANIZATIONAL LEARNING

The third part of our study, on which we've made a bit of headway, involves identification and assessment of learning that is occurring at the organizational / institutional level. The section below provides a brief description of how group learning came to be at DIT. One of the faculty participants explained:

*Problem-based learning I've been doing for a long time, going way back to the early '90s in my course I teach…. I've always believed in giving an ill-defined problem to the class (which was a design problem), and obviously there's no correct answer, there's a system that works and it's optimized to something. So I always feel that's the best way to get students to actually explore a topic. …now I've been using team-based and problem based learning I'd say for the last, oh gosh, six or seven years and probably was driven by [the champion], the enthusiasm [he] had to this, which is brilliant.*

Later, additional faculty members began working together to implement PBL approaches. For instance, 15 years ago, a group of physics teachers at DIT banded together to develop a PBL curriculum that used learning groups as a core concept. The physics teachers effectively functioned as a learning group—although they did not use that term at the time—and they brought in external advisers to help them lay the groundwork for their new programmes.

Faculty across DIT seemed to view the physics group as successful. That encouraged the formation of a Learning and Teaching Centre that helped spur pedagogical innovation across the institute. The Centre was established to generate knowledge and build the capacity of teachers. This unit—now known as the Learning, Teaching and Technology Centre (LTTC)—has offered workshops, seminars, and qualification (i.e., certificate and degree) programmes on a voluntary basis for more than a decade.

The LTTC has fostered group learning across the institution by: (1) bringing together faculty from various parts of DIT and encouraging them to learn and construct new knowledge together, (2) providing grants to faculty members who want to implement new pedagogies, work collaboratively, and implement group-based and problem-

based learning approaches, and (3) expanding the level of support provided by situating a full-time "Head of Learning Development" within each of the institute's four Colleges.

In 2006, DIT even implemented a new policy requiring all newly hired faculty members to either have a qualification / degree in learning and teaching, or to earn one within the first two years of employment at DIT. This bold move is almost unprecedented among institutions of higher education worldwide, but it appears to be accruing benefits to students and faculty. As one faculty participant noted:

*All the lecturers now that are coming in for the last five or six years, they've all had to go through the formal [program in] Teaching and Learning, which is obviously making them aware of what's out there in terms of any new teaching paradigms and things of this nature. And as I say, I engage with them the whole time so I'm probably learning by osmosis through the new staff coming in and saying this is something we should be doing—and I'm quite receptive to that.*

## 4 SUMMARY

In conclusion, learning groups are an important and growing part of the culture of DIT, particularly in engineering. The groups are becoming more visible over time and the format of group learning is gaining recognition. Success is evident among teachers (who maintain on going dialogue about teaching and assessment issues) and students (who are able to discuss what and how they learn). Individual students attributed the group format with helping develop their understanding, leadership skills, and abilities in team management. Further research can help the DIT community in particular, and engineering education in general, understand and refine group project-based learning approaches. Generating new knowledge about how groups function most effectively can help organizations learn and function better as well.

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